CHAPTER 2 Affected Environment, Environmental Consequences, and Avoidance, Minimization, and/or Mitigation Measures

Chapter 2 describes resources in the Human, Physical, and Biological Environments within the Project limits and identifies potential environmental impacts from the proposed Project. Cumulative impacts are discussed in Chapter 3. These discussions provide the basis for the responses to the California Environmental Quality Act (CEQA) Checklist Form (Appendix B of this document).

Caltrans is the lead agency for the Project. It is concluded that impacts due to the proposed Project would be minor and a Categorical Exclusion (CE) will be prepared; therefore, the determination within this document of an impact's level of significance is made solely within the context of CEQA. Per the Council on Environmental Quality Regulations Implementing NEPA, a CE refers to "a category of actions which do not individually or cumulatively have a significant effect on the human environment and which have been found to have no such effect in procedures adopted by a Federal agency in adoption of these procedures (Section 1507.3) and for which, therefore, neither an environmental assessment nor an environmental impact statement is required" (40 CFR 1508.4).

As part of the scoping and environmental analysis conducted for the Project, the following environmental resource areas were also considered, but no potential for adverse impacts was identified: population housing, agriculture resources, growth, paleontology, hazards and hazardous materials, land use and planning, mineral resources, public and emergency services, recreation, environmental justice, community impacts, and invasive species. Table 2-1 provides a brief explanation for the "no adverse impact" determination in these subject areas. The remainder of this chapter covers environmental issue areas that require further consideration or discussion.

Table 2-1 No Adverse Impact Determinations Summary

Population Housing
The Project does not involve the construction of new housing such that any increase in population would occur within the Project area. Nor would the Project result in the removal and/or relocation of existing housing. No impacts to population or housing would occur.
Mineral Resources
The Project site is not located within an area known to contain mineral resources. Because Project implementation would take place within a previously disturbed area not known to contain important mineral resources, the likelihood that mineral resources would be uncovered during project construction is extremely low.
Agriculture Resources

Table 2-1 No Adverse Impact Determinations Summary

The Project will neither convert farmland to non-agricultural use nor conflict with current open space or agriculture land use designations.
Hazards and Hazardous Materials
The Project will not result in any increased hazards or hazardous materials risks after construction. During the development of Project plans, specifications, and estimate, once the exact location of land to be excavated and structures to be modified is known, detailed soil and asbestos surveys will be conducted by Caltrans Office of Environmental Engineering. Any hazardous materials found will be encased or disposed of in accordance with applicable federal and state regulations.
Growth
Growth in the Project area is planned for and accommodated by the Sonoma County General Plan and the City of Petaluma General Plan. This Project has been approved for the City of Petaluma and along this portion of Route 101. This Project is consistent with the General Plan. Travel time delay on the mainline will decrease and, thus, would not eliminate barriers to growth. The Project conforms to the local general plans and does not conflict with Sonoma County's and the City of Petaluma's managed growth policies.
Paleontology
The proposed Project is not anticipated to affect paleontological resources. In the event that paleontological site indicators are unearthed during the course of grading, excavation, and/or trenching, all ground-disturbing work in the vicinity shall cease. Caltrans will contact a qualified professional geologist or paleontologist immediately after the find. The contractor shall not resume construction activities until authorization to proceed is received from Caltrans.
Land Use and Planning
The Project supports local and regional land use plans by improving access to existing urbanized areas that are planned for future development. It does not involve acquisition of residential or commercial structures and will not alter community interaction patterns.
Environmental Justice
Noise, air quality, and visual impacts are distributed evenly through the Project area and are not concentrated in any area of minority or low-income residents. The Project itself would not cause disproportionately high and adverse effects on any minority or low-income populations.
Public Services
The Project will not affect provision of existing public services or measurably increase the need for new or physically altered governmental facilities to maintain acceptable service levels, response times, or other performance objectives for any public service.

Table 2-1 No Adverse Impact Determinations Summary

Recreation
Because the Project will not cause a substantial noise level increase (12 dBA or more), it will not directly or indirectly reduce the recreational value of any nearby properties. Because access to adjacent properties remains the same, it will not measurably change the use of existing neighborhood and regional parks or other recreational facilities.
Emergency Services
The proposed Project would have minimal effect on public services and facilities. Following Project construction, emergency vehicle access (police and fire) would be improved as a result of the Project.
Community Impacts
Although the freeway predates most of the residential and commercial development that has filled in, it does not divide any communities. There are no relocations required and no housing is being displaced during this Project.
Invasive Species
The Project will not increase the potential for the presence of invasive species. The potential for construction-introduced invasive species is considered low, and any required fill would be taken from local areas.

HUMAN ENVIRONMENT

2.1 Utilities

2.1.1 Affected Environment

The relocation of existing underground and aboveground utility facilities will occur within a utility easement outside the future State ROW. Caltrans has confirmed the location of the affected utilities, which include gas, electric, telephone, cable TV, sewer, and water. Utility Agreements will be required for relocations by the City of Petaluma, PG&E, SBC, Water Company, and Comcast.

2.1.2 Environmental Consequences

Construction of the proposed Project would require the relocation of several utility lines, including sewer, water, gas and electric, cable television, and telephone lines. Existing utility lines would be relocated to new easements outside of the proposed ROW. New easements would consist of a 15-foot water and sewer easement and a 10-foot easement for gas and electric lines, telephone, and cable television lines. PG&E utility lines would be relocated prior to Project construction; all other utilities would be relocated as part of construction of the proposed Project.

The relocation of PG& E utility lines would require the relocation and replacement of two wood poles with two tubular steel poles on the Lakeville - Petaluma "C" 60 kilovolt electric transmission line. One tubular steel pole would be approximately fifteen higher than the existing wood pole and the other tubular steel pole would be approximately twenty feet higher than the existing wood pole. The new tubular steel poles would be located within an existing grant of easement to PG&E. The relocation of the existing pole line would be temporary and would not result in any interruption of service.

2.1.3 Avoidance and/or Minimization Measures

None are required.

2.2 Traffic

In an earlier assessment of potential improvements at the Project location, a preliminary traffic modeling and assessment was performed by Caltrans District 3 staff. This analysis was then updated to reflect the final layout of the Project ramps and intersection improvements.

SYNCHRO 5.0 was used to build the traffic models. The Base Year model was calibrated to replicate existing conditions based on observed conditions and traffic counts. Models of future scenarios use the Base Year model as a template with proposed volume changes and geometric improvements incorporated. SYNCHRO is primarily a signal optimization program. SimTraffic was also used to simulate the SYNCHRO models and create an animated view of the network operations.

"Level of Service" is commonly used to describe the traffic operation at signalized intersections. The 2000 Highway Capacity Manual defines levels of service for signalized intersections in terms of control delay, as described in Table 2-2.

Table 2-2 Signalized Intersection Levels of Service

Level of Service	Control Delay (sec/vehicle)
A	≤10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

2.2.1 Affected Environment

In the vicinity of the proposed Project, Route 101 consists of a four-lane highway mainline, with two northbound and two southbound lanes. The existing on- and off-ramps to Route 101 along this stretch of highway feeds traffic to and from the mainline of Route 101 onto East Washington Street, a local four-lane roadway.

A new diagonal on-ramp would be constructed requiring a new bridge over Washington Creek, which would allow for the widening of the on-ramps and increase the amount of available storage. The existing northbound on/off-ramps traffic signal at East Washington Street would be upgraded and lanes restriped to improve the traffic flow in the vicinity of East Washington Street and the on/off-ramps.

2.2.2 Environmental Consequences

Traffic impacts associated with the proposed Project have been assessed as a function of operating conditions during peak period conditions on the freeway and local intersections within the Project vicinity. Traffic flow analysis conducted in conjunction with Project design indicates that the Project would reduce congestion.

The traffic impact studies analyzed a network consisting of three intersections on East Washington Street: the southbound Route 101 off-ramp, northbound Route 101 off-ramp, and McDowell Boulevard intersections. Year 2030 AM and PM peak hour traffic projections with the proposed Project were used for this study. (Note that traffic projections indicate that the PM peak hour traffic volume of the northbound on-ramp[s], for example, is about 25 percent lower without the proposed Project. It is not anticipated that the relatively modest improvements in this interchange would have significant impact on the on-ramp volume, so the heavier of the two on-ramp traffic projections was used for both alternatives for this study.)

It is anticipated that the proposed Project would not have an adverse impact on overall traffic operations, based on current traffic projections. The expected impacts of the proposed modifications are described in the following paragraphs.

The westbound East Washington street left turn to the northbound freeway on-ramp would be eliminated. This modification would allow the northbound ramps/East Washington Street intersection to operate with a two-phase – instead of a three-phase – traffic signal. This would provide more efficient signal operation and allow for more signal green time to be assigned to the remaining intersection traffic movements.

Elimination of the westbound East Washington Street left turn to the northbound freeway on-ramp would also allow the two left-turn lanes on eastbound East Washington Street at the McDowell Boulevard intersection to be lengthened. This would provide more capacity for the left-turn movement at the McDowell Boulevard intersection.

The proposed improvements would reduce or eliminate the probability that northbound off-ramp traffic backups would extend onto the freeway. Year 2030 peak hour traffic operations were modeled using the SimTraffic program. Some simulations showed a substantial backup onto the freeway without the proposed Project during the PM peak hour, but no backup onto the freeway with the proposed Project. The SimTraffic program is only an approximation, and should only be taken as an indicator of potential conditions. The possibility of a backup onto the freeway would depend on the amount of signal green time provided to clear the off-ramp movement, which could be based on factors other than traffic volumes. However, simplification of the northbound Route 101 off-ramp/

East Washington Street intersection is expected to allow more time for the off-ramp movement, and backups onto the freeway would be less likely to occur with the proposed Project.

It is not anticipated that the second northbound on-ramp would have an adverse impact on freeway traffic operations. Traffic projections indicate that, in 2030, the mixed-flow lanes of northbound Route 101 would be operating close to capacity (4,100 vehicles per hour in the mixed-flow lanes; 1,000 vehicles/hour in the HOV lane) downstream of the East Washington Street on-ramp(s) during the PM peak hour. During this time, it is projected that the two on-ramp lanes would carry a total of about 1,000 vehicles per hour. If only one on-ramp was in service, there is a possibility that "platooned" on-ramp vehicles could cause intermittent congestion problems at the merge of northbound Route 101 and the on-ramp. If two on-ramps were provided, on-ramp platoons would be smaller, and the possibility of intermittent congestion problems would be lessened.

Analysis of year 2030 AM and PM peak hour traffic volumes shows that, if traffic growth occurred as projected, East Washington Street would experience heavy traffic congestion during AM and PM peak hours in 2030. During the AM peak hour, the southbound off-ramp/East Washington Street intersection would be operating at capacity, and the McDowell Boulevard/East Washington Street intersection would be operating within 10 percent of capacity. During the PM peak hour, the projected peak hour vehicle demand at both of these intersections would be between 15 and 20 percent above the intersection capacities, and traffic would experience substantial congestion.

An analysis of intersection traffic operations using the analysis program SYNCHRO shows that the northbound Route 101 off-ramp/East Washington Street intersection would operate below capacity during the AM peak hour. During the PM peak hour, the analysis indicates that the northbound ramps intersection would itself operate at or near capacity if the proposed improvements were not provided, but could operate 75 to 80 percent of capacity if the proposed improvements were provided. The actual operation of this intersection would depend on the signal phasing and coordination with adjacent intersections; however, the northbound ramps intersection would likely experience peak hour traffic congestion in 2030 due to traffic backups extending into this intersection from adjacent intersections. Table 2-3 shows the results of the intersection analysis of the proposed Project.

Table 2-3 Year 2030 Levels of Service

Intersection Location	Year 2030 Level of Service			
	AM Peak Hour		PM Peak Hour	
	No Project	Project	No Project	Project
East Washington St./McDowell Blvd.	E	E	F	F
East Washington St./NB Ramps	D	B	F	D
East Washington St./SB ramps	F	F	F	F

2.2.3 Avoidance, Minimization, and/or Mitigation Measures

The proposed Project is projected to produce a beneficial impact on traffic conditions. No significant negative impacts are identified; therefore, no avoidance and/or minimization measures are required.

2.3 Visual Aesthetics

Visual impacts of the proposed Project were evaluated in accordance with the FHWA Visual Impact Assessment (VIA) methodology (ASLA/FHWA, 1988). (The VIA prepared for this project will be made available for public review during the ISMND public comment period at Caltrans District 4 offices, SCTA, and the Petaluma Public Library.) The assessment of existing visual quality of the Project setting was based on three criteria defined in that methodology: vividness, intactness, and unity. Vividness is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns. Intactness is the visual integrity of the natural or man-made landscape of the immediate environs and its freedom from encroaching elements. Unity is the degree to which the visual elements of the landscape join together to form a coherent, harmonious visual pattern.

2.3.1 Affected Environment

The Project is situated within a single landscape unit, comprising the level, rapidly urbanizing valley floor of the City of Petaluma, which is the southernmost of a string of low-lying valleys that extend northward past the City of Santa Rosa along the Highway 101 corridor. Figure 2.3-1 is an overview of the immediate proposed Project setting, consisting of the highway segment in the vicinity of the East Washington Street Interchange. This segment of the highway corridor crosses some of the more urbanized portions of Petaluma, and is not designated or considered to be eligible as a State Scenic Highway. Adjacent land uses consist primarily of commercial, light industrial, and residential areas abutting the highway, and also include the Marin-Sonoma County Fairgrounds and a vacant lot. The Project corridor is currently characterized by tall (65 feet [20 meters] or more), dense roadside tree hedgerows, primarily eucalyptus and redwoods. These tend to enclose and restrict views to within the roadway, provide strong visual separation between the road and adjacent land uses, and lend a vivid, recognizable image to the approaches to the interchange, a principal City entry gateway (see Figure 2.3-2a, Project Setting Photos). These hedgerows line the entire Project segment on both shoulders, including the ramp shoulders at the East Washington Interchange.

As typical in the Route 101 corridor throughout Sonoma County, redwood trees at the highway shoulder are an important component of the regional visual image. Many of the redwoods within the Project limits, however, particularly on the west shoulder of the highway, are stressed, disfigured, and appear to be dying or in very poor condition; only the eucalyptus appear healthy. Visible major vegetation outside of the highway ROW in this segment is negligible. Freeway over-crossings at Caulfield Lane, East Washington Street, and Corona Road punctuate views from the road but remain subordinate to the tall, visually dominant tree rows. Scenic views are absent in this highway segment, with views constrained to within the roadway itself by the enclosing tree hedgerows (see Figure 2.3-2b).

The existing highway within the Project limits is a four-lane roadway with unpaved center median separated by metal beam guardrail. In addition to the East Washington Street over-crossing bridge,

the East Washington Interchange includes earth embankments with substantial landscaping, including stands of young redwood trees that appear healthy, and a large stand of mature poplars in the northeastern corner of the interchange. The low-lying portions of the interchange loops are landscaped with lower-growing shrubs (see Figure 2.3-2c).

Potentially sensitive visual receptors in the Project area include very high numbers of motorists on Route 101 and East Washington Street with moderate overall levels of anticipated viewer sensitivity and a moderate number of homes directly adjoining the roadway in the northwest and southeast quadrants with potentially high levels of anticipated viewer sensitivity. Land uses adjoining the proposed on-ramps in the northeast and southwest Project quadrants are predominantly of low visual sensitivity, consisting of a vacant lot in the southwest and loading docks in the northeast. However, a senior apartment complex adjoining the road in the northeast quadrant south of Lynch Creek is of potentially high viewer sensitivity.

2.3.2 Environmental Consequences

Impacts were assessed according to FHWA methodology and criteria presented in Appendix G of the CEQA Guidelines. Under the VIA methodology, a substantial decline in visual quality (vividness, intactness, and unity) in combination with high levels of viewer sensitivity and exposure have the potential for substantially adverse results. Appendix G of the CEQA Guidelines lists the following criteria to determine whether the potential impacts of a Project are potentially significant:

1. Would the Project have a substantial adverse effect on a scenic vista?

2. Would the Project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

3. Would the Project substantially degrade the existing visual character or quality of the site and its surroundings?

4. Would the Project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Major Project Visual Features

For the purpose of analysis, the Project is described below in terms of four quadrants, defined by the centerlines of East Washington Street and Route 101 as indicated on Figure 2.3-1.

Under the proposed Project, a new two-lane diagonal northbound on-ramp, including a free-span bridge over Washington Creek, would be constructed east of the existing Project mainline from East Washington Street. This ramp would require two new retaining walls on the highway and community side, respectively. East Washington Street would be widened northeast of the highway to provide a right turn lane for traffic between westbound East Washington Street and northbound Route 101, requiring a new retaining wall to the north of East Washington Street.

Figure 2.3-1 Aerial Overview of Project Setting

Figure 2.3-2 Project Setting Photos

a. Existing facility with redwood and eucalyptus hedgerows

b. Typical stressed redwoods on west highway shoulder

c. Existing interchange and landscaping

The existing single-lane southbound on-ramp would be realigned to improve the curve radius and provide two lanes to accommodate ramp metering. A new concrete-lined and unlined drainage ditch and parallel bio-strip would be required along the length of the southwest Project quadrant.

Existing underground utilities in the northeast quadrant would be relocated to a utility easement outside of and adjacent to the future State ROW.

Impacts to Motorists and Community Image

Impacts to motorists and the community in views from the roadway would include a substantial decline in visual quality of the corridor due to removal of nearly all of the approximately 592 existing redwood and other trees at the highway shoulders in the northeast and southwest Project quadrants (approximately 780 trees total). Removal of the existing tree hedgerows would result in a marked decline in vividness, intactness, and unity of the setting, transforming the existing forward-directed, enclosed views dominated by tree canopy to more open views of the vacant lot in the southwest Project quadrant, retail development on that site proposed in the near future, and loading docks of the adjacent Petaluma Plaza Shopping Center in the northeast quadrant. The new northbound on-ramp would introduce a tall retaining wall into the visual foreground of the freeway in the northeast quadrant, with a resulting increase in the dominance of hardscape in the interchange vicinity, and corresponding decline in visual quality.

Figure 2.3-3 depicts anticipated Project effects in the southwest Project quadrant, including the widened, realigned southbound on-ramp, as seen from the vicinity of the East Washington Interchange northbound off-ramp, looking south.

Ramp widening, realignment, and creation of a new drainage system in the southwest quadrant would require removal of the existing, unhealthy redwood trees west of the highway and on-ramp. These roadway improvements would result in a decline in vividness and intactness of the interchange vicinity viewscape through loss of tree canopy, which screens the adjacent property. Tree screening in this quadrant consists entirely of redwoods, which are in poor health. As a result, the visual quality of the existing tree rows is relatively poor, as depicted on Figure 2.3-2b. It appears likely that this loss of screening would also result, in time, without the proposed Project because of unsuitable growing conditions for the existing redwoods. The exposed property, currently a vacant lot, is proposed for retail use in the near future. Adverse effects of tree removal would be partially offset by planting vines on chain-link fence at the ROW, and tall shrubs, where feasible, between a proposed 10-foot (3-meter) bio-strip and 6.5-foot (2-meter), lined drainage ditch, as recommended in the protective measures described below and depicted in the visual simulation (Figure 2.3-3) and Typical Cross Section in Southwest Project Quadrant (Figure 2.3-4). With this measure, screening of the adjacent site, and a degree of visual intactness and unity, would be restored in a relatively short period of time with maturation of shrub plantings.
Figure 2.3-5 depicts the proposed northbound on-ramp in the northeast Project quadrant, as seen from the East Washington Street Interchange bridge, looking north.

In the northeast Project quadrant, removal of existing tree rows to accommodate the proposed northbound on-ramp would represent a substantial decline in the visual quality of highway views. The trees in this quadrant consist primarily of redwood, but in better health than in the southwest quadrant.

Existing View

Simulated View

Figure 2.3-3 Existing and Simulated Views of Southwest Project Quadrant, Looking South

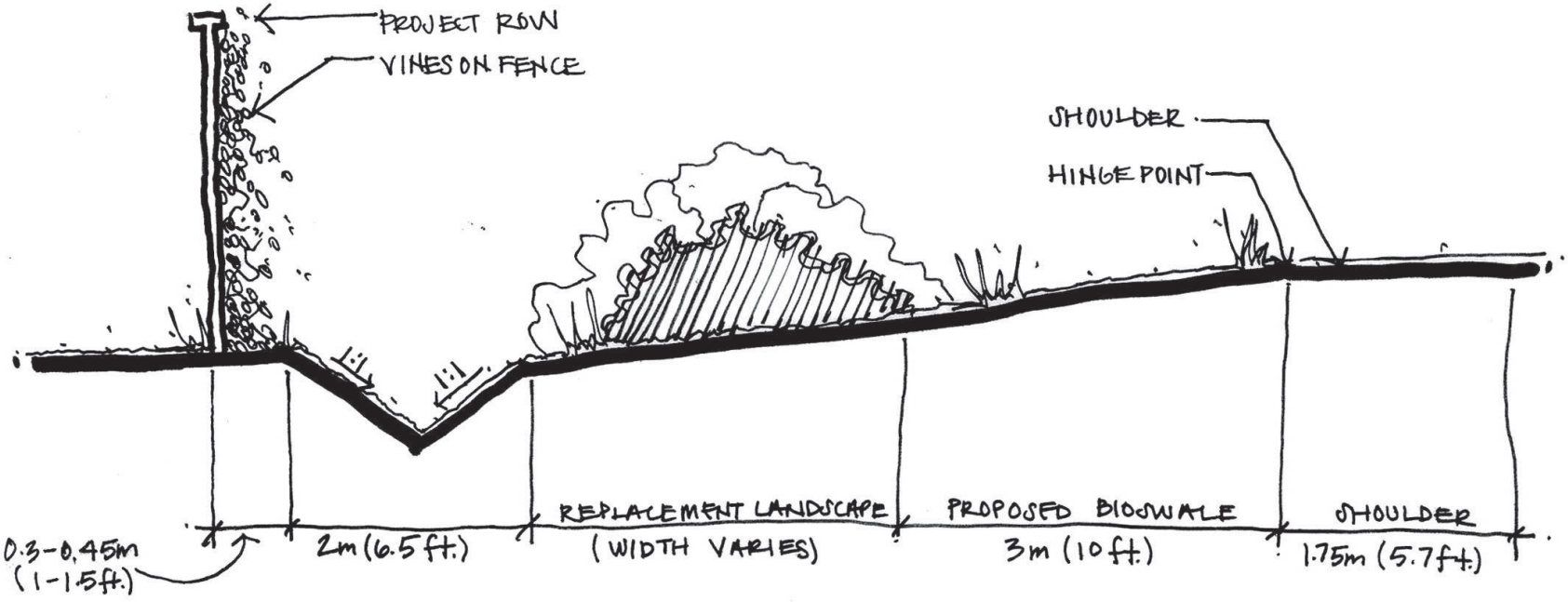

Figure 2.3-4 Typical Cross Section in Southwest Project Quadrant

Tree removal would represent a substantial decline in intactness and vividness from loss of the tree canopy, as well as exposure of unattractive loading docks, storage areas, and parking of the Petaluma Plaza Shopping Center into the immediate visual foreground of motorists on the new on-ramp, and on portions of the highway mainline in the area where the ramp merges.

The west side of the new northbound on-ramp would introduce a tall retaining wall into the visual foreground of the freeway, with a resulting increase in the dominance of hardscape and some decline in visual quality in the interchange vicinity. However, as also depicted on Figure 2.3-5, decorative texture treatment would reduce visual monotony and contrast of the wall in the short term, and recommended landscaping between the ramp and highway shoulder would substantially screen and soften the wall with maturation of the plantings. A similar new retaining wall on the community (east) side of the new on-ramp would face existing loading docks and similar low-sensitivity uses and would thus have negligible impact on views toward the road. Within the East Washington Interchange, construction of the proposed westbound to Route 101 northbound turn lane on East Washington Street would require a new retaining wall on the north side of the street. It currently appears that the adjacent stand of poplar trees could be preserved during wall construction. If their preservation proves infeasible, this tree removal would result in a further adverse decline in visual quality at the interchange.

Overall, the effect of the proposed Project on community image and views of motorists would, without mitigation, be a transformation from the existing visual setting dominated by tall tree rows at the shoulder to one dominated to a greater degree by hardscape – increased paving and ramps – and open, unsightly views of loading docks, a vacant lot, and potential additional future loading docks. The resulting decline in visual quality would be potentially substantial. However, loss of the highly compromised redwoods in the southwest quadrant would represent a moderate overall decline in visual quality, considering their poor existing condition, and the substantial remaining tree rows in the northwest and southeast Project quadrants would continue to dominate the community image of the interchange vicinity, particularly in the north- and southbound approaches to the interchange, because of their great size, prominence, and vividness. With mitigation measures as described below, Project impacts to community image and views from the road, though adverse, would remain less than significant.

Impacts on Views to the Road

Nearby residents adjoining the highway in the northwest and southeast quadrants would be unaffected by the proposed Project. Adjoining uses in the northeast and southwest quadrants are predominantly of low or negligible visual sensitivity. In the northeast quadrant, adjoining uses consist primarily of loading docks and employee parking of the Petaluma Plaza Shopping Center. In the southwest quadrant, adjoining land use consists of a vacant lot, with no sensitive viewers.

Figure 2.3-6 depicts the existing view of the highway from the Vintage Chateau Apartments south of Lynch Creek in the northeast Project quadrant. North of the proposed new northbound on-ramp, outside shoulder widening would be required to accommodate a ramp merging lane and anticipated future bridge widening at Lynch Creek. West-facing apartments of the two-story Vintage Chateau retirement community in that road segment are potentially sensitive visual receptors, with windows and outdoor use areas facing the freeway at close distance. Removal of existing redwood trees in that

Existing View

Simulated View

Figure 2.3-5 Existing and Simulated Views of Northeast Project Quadrant, As Seen from the East Washington Street Interchange Bridge Looking North

Apartments South of Lynch Creek, Looking West Toward Freeway, Redwood Trees.

Apartments South of Lynch Creek, Looking South. Freeway Right-of-Way, Redwood Trees Are on Right.

Recommended Mitigation Measure VM-7: Typical Section at Vintage Chateau Apartments.

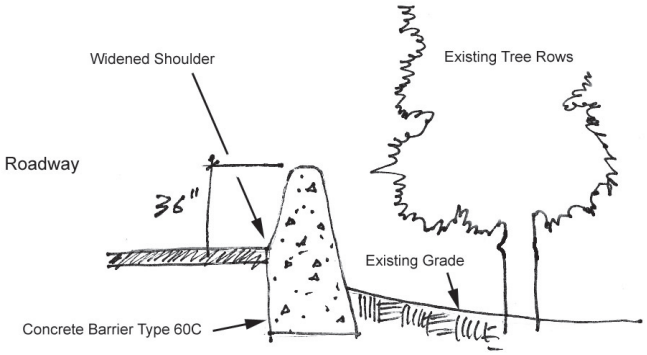

Figure 2.3-6 View of Highway from Vintage Chateau Apartments

location would potentially result in a substantial decline in visual quality for residential viewers with moderately high viewer sensitivity. Foreground views of tall redwood canopies would be replaced by fully exposed views of the adjacent freeway. Further, redwood trees in this location are tall, mature, and appear healthy. To avoid removing existing redwood trees and resulting exposure of apartments to highway views, a concrete shoulder barrier is recommended to retain the widened roadway in this location, as depicted on Figure 2.3-6, Recommended Mitigation Measure VM-7: Typical Section at Vintage Chateau Apartments.

As set forth in Mitigation Measure VM-7, if preservation of the existing redwoods proves infeasible, in-kind tree replacement at the shoulder utilizing large container plant material would occur. With preservation of the trees, Project impacts to residents would be negligible; however, if preservation of the existing redwoods is not possible, their removal would result in adverse short-term visual impacts. In the long term (10 to 20 years), project impacts would be reduced to a less-than-significant level with implementation of replacement planting and impacts to residents at the apartments would remain less-than-significant overall.

Light and Glare Impacts

Potential Project-related light and glare impacts would be associated primarily with temporary nighttime construction lighting in proximity to sensitive receptors, including motorists, pedestrians, and nearby residences. However, with implementation of recommended control measures for construction lighting as described below, no substantial light and glare impacts are anticipated.

Removal of existing tree screening along the proposed northbound on-ramp could result in some exposure of adjacent apartments to long-term car headlight glare, with potentially substantial adverse impacts to residents. To minimize this potential impact, permanent opaque screening shall be installed at the highway ROW to block all such glare under Mitigation Measure VM-8.

2.3.3 Avoidance, Minimization, and Mitigation Measures

Mitigation Measure 2.3-1: Replacement Landscaping in Southwest Quadrant between Proposed Bio-strip and Drainage Ditch

In the southwest quadrant of the Project, including southbound on-ramp, tall shrubs shall be planted to the maximum feasible extent within available planting areas between the proposed bio-strip and drainage ditch. New vines shall also be planted on chain link fence at the Project ROW line.

Mitigation Measure 2.3-2: Enhanced Redwood Planting on Interchange Embankments; Enhanced Redwood Planting in Offsite Locations

To partially offset impacts from the loss of trees in the Project corridor, additional new tree plantings shall be installed on the earth embankments within the interchange, particularly near the mainline, consistent with required standard sight lines and other safety considerations. In addition, a range of new tree groupings shall be planted within the highway ROW in other portions of Route 101 where such plantings are feasible consistent with standard safety considerations including, but not limited to, portions of the highway ROW between Lynch Creek and Corona Road. In the long term, these

groupings would provide an enhanced City gateway statement at the interchange, and partially compensate for the loss of large-scale vegetation elsewhere in the Project segment.

Mitigation Measure 2.3-3: Northbound On-ramp Retaining Wall Mitigation Measures

Design measures shall be applied to northbound on-ramp retaining walls. Caltrans will coordinate development of these measures with the City of Petaluma. Such measures may include concrete surface texture and color treatments, context-sensitive design themes, or other measures to enhance corridor visual quality. Structure design measures shall be designed to maintain visual and design consistency within the Project limits, and an awareness of, and cohesion with, existing and proposed visual and design themes within the larger Marin and Sonoma County 101 corridor.

To offset potential impacts from intrusion of the new northbound on-ramp, landscaping between the ramp and roadway shall be installed to screen the west-facing retaining wall in the long term.

Mitigation Measure 2.3-4: Visual Screening of Shopping Center Loading Docks

On the east edge of the proposed northbound on-ramp, where tree removal exposes views of adjoining commercial uses to the highway, visually opaque barriers consisting of 3-foot (1-m) black-vinyl-clad chain link fence with brown slats shall be constructed atop the east ramp retaining wall to visually screen views of motorists into adjoining properties. Vines shall also be planted at the ROW line if feasible.

Mitigation Measure 2.3-5: Minimization of Tree Removal in Interchange and on East Washington Street

To enable preservation of poplars and other trees to the greatest feasible extent, the following measures are proposed:

- Clearing and grubbing within the interchange will be limited to excavation on embankment slope lines
- Existing vegetation outside of clearing and grubbing limits shall be protected from the contractor's operations, equipment, and materials storage
- Tree trimming by the contractor shall be limited to that required to provide a clear work area
- Prior to commencement of roadway construction, high-visibility protective fencing shall be placed around trees that are not subject to removal
- All trees to be removed shall be field-marked for removal by the contractor and verified/approved by the resident engineer prior to removal
- Wherever feasible, slope lines shall be adjusted to avoid tree removal.

Mitigation Measure 2.3-6: Replacement Planting Within Interchange

If preservation of poplars at East Washington Street proves infeasible, replacement planting shall be installed north of the wall on a 1-to-1 basis or greater, using 24-box plant material. Replacement planting with redwood is recommended to enhance the redwood image of the interchange, in coordination with measure VM-2.

Mitigation Measure 2.3-7: Preservation of Existing Trees, or Replacement Planting at Frontage of Apartments in Northeast Quadrant

North of the point where the proposed northbound on-ramp merges with the highway mainline, proposed road widening shall utilize a Type 60C concrete barrier to retain the widened road edge to preserve existing redwood trees at the frontage of adjoining apartments. If removal of any trees in this segment is unavoidable, they shall be replaced in-kind with 24-inch container plant material.

Mitigation Measure 2.3-8: Mitigation of Construction-related Light and Glare Impacts

All nighttime construction lighting shall be shielded and directed to eliminate all direct lighting outside of the construction area. Where substantial headlight glare could affect residences during construction, opaque screening shall be introduced to block such headlight glare for the duration of the construction period. If headlight glare could affect residents at apartments on a long-term basis, permanent screening shall be installed at the highway ROW to block headlight glare.

With these recommended mitigation measures, Project impacts, though adverse, would be reduced to less than significant levels in the long term with maturation of replacement landscape plantings.

2.4 Air Quality

2.4.1 Regulatory Setting (National Ambient Air Quality Standards and Regional Conformity)

The Clean Air Act (CAA) as amended in 1990 is the federal law that governs air quality. Its counterpart in California is the California Clean Air Act (CCAA) of 1988. These laws set standards for the quantity of pollutants that can be in the air. At the federal level, these standards are called National Ambient Air Quality Standards (NAAQS). Standards have been established for six criteria pollutants that have been linked to potential health concerns. The criteria pollutants are carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter, lead, and sulfur dioxide (SO_2). The federal and state ambient air quality standards are shown in Table 2.4-1.

Under the 1990 CAA Amendments, the U.S. Department of Transportation cannot fund, authorize, or approve Federal actions to support programs or projects that are not first found to conform to State Implementation Plan (SIP) for achieving the goals of the CAA requirements. Conformity with the CAA takes place on two levels: first, at the regional level and second, at the project level. The proposed project must conform at both levels to be approved.

Table 2.4-1 Ambient Air Quality Standards and Bay Area Attainment Status

		California Standards[a]		National Standards[b]	
Pollutant	**Averaging Time**	**Concentration**		**Concentration[c]**	**Attainment Status**
Ozone	8 Hour	0.070 ppm (137µg/m^3)	U[d]	0.08 ppm	N[e]
	1 Hour	0.09 ppm (180 µg/m^3)	N		[f]
Carbon Monoxide	8 Hour	9.0 ppm (10 mg/m^3)	A	9 ppm (10 mg/m^3)	A[g]
	1 Hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	A
Nitrogen Dioxide	Annual Average			0.053 ppm (100 µg/m^3)	A
	1 Hour	0.25 ppm (470 µg/m^3)	A		
Sulfur Dioxide	Annual Average			80 µg/m^3 (0.03 ppm)	A
	24 Hour	0.04 ppm (105 µg/m^3)	A	0.14 ppm (365 µg/m^3)	A
	1 Hour	0.25 ppm (655 µg/m^3)	A		
Particulate Matter	Annual Arithmetic Mean	20 µg/m^3	N[h]	50 µg/m^3	A
(PM_{10})	24 Hour	50 µg/m^3	N	150 µg/m^3	U
Particulate Matter	Annual Arithmetic Mean	12 µg/m^3	N[h]	15 µg/m^3	A
($PM_{2.5}$)	24 Hour			35 µg/m$^{3[i]}$	U
Sulfates	24 Hour	25 µg/m^3	A		
Lead	Calendar Quarter			1.5 µg/m^3	A
	30 Day Average	1.5 µg/m^3	A		
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	U		
Vinyl Chloride (chloroethene)	24 Hour	0.010 ppm (26 µg/m^3)			
Visibility Reducing Particles	8 Hour (1000 to 1800 PST)	See footnote J	A		

A	=	Attainment
N	=	Nonattainment
U	=	Unclassified
mg/m^3	=	milligrams per cubic meter
$\mu g/m^3$	=	micrograms per cubic meter
ppm	=	parts per million

Source: Bay Area Air Quality Management District (BAAQMD) internet site, 1/4/2007

Notes:

[a]California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter (PM_{10}), and visibility-reducing particles are values that are not to be exceeded. The standards for sulfates, Lake Tahoe carbon monoxide, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded. If the standard is for a 1-hour, 8-hour, or 24-hour average (i.e., all standards except for lead and the PM_{10} annual standard), then some measurements may be excluded. In particular, measurements are excluded that the California Air Resources Board determines would occur less than once per year on the average. The Lake Tahoe CO standard is 6.0 ppm, a level one-half the national standard and two-thirds the State standard.

[b]National standards other than for ozone, particulates, and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent 3-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the fourth highest daily concentrations is 0.08 ppm or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 $\mu g/m^3$. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of 98th percentiles is less than 65 $\mu g/m^3$. Except for the national particulate standards, annual standards are met if the annual average falls below the standard at every site. The national annual particulate standard for PM_{10} is met if the 3-year average falls below the standard at every site. The annual $PM_{2.5}$ standard is met if the 3-year average of annual averages spatially averaged across officially designed clusters of sites falls below the standard.

[c]National air quality standards are set at levels determined to be protective of public health with an adequate margin of safety. Each state must attain these standards no later than 3 years after that state's implementation plan is approved by the Environmental Protection Agency (U.S. EPA).

[d]This standard was approved by the Air Resources Board on April 28, 2005 and became effective on May 17, 2006.

[e]In June 2004, the Bay Area was designated as a marginal nonattainment area of the national 8-hour O_3 standard.

[f]The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005.

[g]In April 1998, the Bay Area was redesignated to attainment for the national 8-hour CO standard.

[h]In June 2002, CARB established new annual standards for $PM_{2.5}$ and PM_{10}.

[i]U.S. EPA lowered the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ in 2006. The EPA is required to designate the attainment status of BAAQMD for the new standard by December 2009.

[j]Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

Regional level conformity in California is concerned with how well the region is meeting the standards set for CO, NO_2, O_3, and particulate matter. California is in attainment for the other criteria pollutants. At the regional level, Regional Transportation Plans (RTP) are developed that include all of the transportation projects planned for a region over a period of years, usually at least 20. Based on the projects included in the RTP, an air quality model is run to determine whether or not the implementation of those projects would conform to emission budgets or other tests showing that CAA attainment requirements for CO, NO_2, O_3 and particulate matter are met. If the conformity analysis is successful, the regional planning organization, such as the Metropolitan Transportation Commission

(MTC) and the FHWA, make the determination that the RTP is in conformity with the SIP for achieving the CAA goals. Otherwise, the projects in the RTP must be modified until conformity is attained. If the design and scope of the proposed transportation project are the same as described in the RTP, then the proposed project is deemed to meet regional conformity requirements of project-level analysis. The MTC prepares and adopts the TIP every 2 years. The proposed project was included in the most recent TIP (2005), and approved by the FHWA on October 1, 2004. On February 23, 2005, the MTC issued a final transportation conformity finding for the Transportation 2030 Plan and the 2005 TIP/Amendment #05-05. The FHWA approved this conformity finding on March 17, 2005. Because the design concept and scope of the Project have not changed, the project conforms to the SIP.

Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are NAAQS, U.S. EPA also regulates a list of air toxics (64 Federal Register [FR] 38706). Air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), air sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics identified by the U.S. EPA. MSATs are emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as by-products. Metal air toxics result from engine wear or from impurities in oil or gasoline.

The U.S. EPA is the lead federal agency for administering the CAA and has certain responsibilities regarding the health effects of MSATs. The U.S. EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources 66 FR 17229 (March 29, 2001). This rule was issued under the authority of CAA Section 202.

In its rule, U.S. EPA also examined the impacts of existing and newly formulated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulphur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in nationwide VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 to 65 percent, and will reduce on-highway diesel particulate matter emissions by 87 percent.

In 1998, California identified diesel particulate matter (diesel PM) as a toxic air contaminant based on its potential to cause cancer and other adverse health impacts. In addition, to diesel PM, emissions from diesel-fueled engines include over 40 other cancer causing substances. In September 2000, the CARB approved a comprehensive Diesel Risk Reduction Plan (Plan) to reduce diesel PM emissions and the associated health risk by 75 percent in 2010 and 85 percent or more by 2020.

2.4.2 Affected Environment

Climate

The Bay Area is characterized by cool, dry summers and mild, wet winters. Temperature in the project area and its vicinity averages approximately 58 degrees Fahrenheit annually, with an average maximum summer temperature of approximately 82 degrees Fahrenheit and an average minimum winter temperature of approximately 38 degrees Fahrenheit. The Eastern Pacific High, which is a strong persistent anticyclone, is the major influence on the climate in the area. The area experiences little precipitation during the summer months, when a high-pressure cell prevents storms from affecting the California coast. During the winter, the high-pressure cell weakens and shifts southward. Storms occur more frequently and winds are usually moderate.

Existing Air Quality

Low wind speeds and temperature inversions contribute to the buildup of air pollution. Low wind speed contributes to the buildup or air pollution because it allows more pollutants to accumulate in the air within a period of time. The highest air pollutant concentrations in the Bay Area generally occur during inversions, when temperature increase as altitude increases, thereby preventing air close to the ground from mixing with the air above it. As a result, air pollutants are trapped near the ground. Under the CCAA, the Sonoma County portion of the Bay Area Air Basin is designated as a non-attainment area for O_3, PM_{10}, and $PM_{2.5}$. Under the CAA, the Sonoma County portion of the Bay Area Air Basin is designated as a non-attainment area for O_3 as shown in Table 2.4-1.

Carbon Monoxide: CO is almost exclusively emitted by motor vehicles. This pollutant binds the oxygen-carrying protein in blood to hemoglobin, reducing the amount of oxygen reaching the heart and brain. Exposure to CO, even at low levels, can endanger people with coronary artery disease. It can also cause headaches, fatigue, and slow reflexes, even among healthy people.

Typical symptoms experienced by some people where levels of CO substantially exceed state and federal air quality standards are headaches and dizziness.

Violations of the CO standards usually occur in the winter during periods of ground-based weather inversions (i.e., when warm air above traps a layer of cold air beneath, near ground level) with very low wind speed.

The data monitored at the BAAQMD station in Santa Rosa, the nearest station to the project site, show no violations of the federal and state CO standards in the 3 years from 2003 to 2005, as shown in Table 2.4-2.

Table 2.4-22003 - 2005 Criteria Pollutant Violations: Santa Rosa – 5th Street Monitoring Station

Pollutant	Standard Exceedance	2005	2004	2003
Ozone (1 hour)	Maximum 1-hr concentration (ppm)	0.072	0.080	0.100
	Days > 0.12 ppm (federal 1-hr standard)	0	0	0

Table 2.4-22003 - 2005 Criteria Pollutant Violations: Santa Rosa – 5th Street Monitoring Station

Pollutant	Standard Exceedance	2005	2004	2003
	Days > 0.09 ppm (state 1-hr standard)	0	0	1
Ozone (8 hour)	Maximum 8-hr concentration (ppm)	0.051	0.060	0.080
	Days > 0.08 ppm (federal 8-hr standard)	0	0	0
Carbon Monoxide	Maximum 8-hr concentration (ppm)	2.0	1.60	1.80
	Days > 9 ppm (federal 8-hr standard)	0	0	0
	Days > 9.0 ppm (state 8-hr standard)	0	0	0
Nitrogen Dioxide	Maximum 1-hr concentration (ppm)	0.047	0.050	0.060
	Days > 0.25 ppm (state 1-hr standard)	0	0	0
$PM_{2.5}$	Maximum 24-hr concentration ($\mu g/m^3$)	33.6	27.0	39.0
	Days >65 $\mu g/m^3$ (federal 24-hr standard)	0	0	0
PM_{10}	Maximum 24-hr concentration ($\mu g/m^3$)	39.0	48.0	36.0
	Estimated days > 150 $\mu g/m^3$ (federal 24-hr standard)	0	0	0
	Estimated days > 50 $\mu g/m^3$ (state 24-hr standard)	0	0	0
Source: California Air Resources Board, January 4, 2007.				

Ozone: O_3 is the primary constituent of photochemical smog. It is not emitted directly into the atmosphere, but is produced through a complex series of chemical reactions involving hydrocarbons and oxides of nitrogen (NO_x), in the presence of sunlight. Vehicle exhaust emissions contribute about half of the pollutants that form ozone. High ozone levels occur primarily in the summer and early fall. High O_3 levels aggravate asthma, bronchitis, and other respiratory ailments, as well as cardiovascular disease. High concentrations of O_3 may also cause dizziness, headaches, burning of eyes and throat, and nausea.

The general structure of oxidant or ozone problems is that morning emissions of hydrocarbons and NO_x react in the presence of sunlight over the next few hours or days to produce a peak oxidant concentration later. As these reactions occur, the air mass is normally transported by the wind. Consequently, the peak oxidant concentrations in the Bay Area tend to occur downwind of the areas where the emissions were released, settling in areas like San Jose and Livermore. Photochemical oxidants cannot, therefore, be said to be caused by a specific source, nor do peak concentrations invariably occur in the vicinity of emission sources. Thus, photochemical oxidants are an areawide pollution problem and require a regional analysis such as that done by MTC.

The data monitored at the BAAQMD station in Santa Rosa show no violations of the federal standards and only one violation of the state ozone standards in 3 years from 2003 to 2005, as shown in Table 2.4-2.

Oxides of Nitrogen (NO_x): Nitrogen oxides are produced by motor vehicles (particularly heavy-duty vehicles) and high-temperature industrial operations. They have not posed a separate, serious health problem in the Bay Area in the past several years but help to create the ozone problem.

Sulfur Dioxide: SO_2 is produced primarily by petroleum refineries and by the combustion of sulfur-containing coal and oil in power plants. Only 20 percent is produced by burning diesel oil and other fuels in motor vehicles. Although SO_2 can be a serious health hazard, no excess of either state or federal standards has been recorded since 1976.

Fine Particulate Matter (PM_{10} and $PM_{2.5}$): Fine particulate matter (PM_{10}, or particulate matter less than 10 microns in diameter) includes a wide range of solid or liquid particles, dust, smoke, aerosols, and metallic oxides. $PM_{2.5}$ refers to particulate matter that is 2.5 microns or less in diameter. When inhaled, PM_{10} and $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract. There are many sources of PM_{10} emissions, including industrial processes, grading and construction, wood burning stoves and fireplaces, and motor vehicles. Of the PM_{10} emissions associated with motor vehicle use, some are tailpipe and tire wear emissions, but greater quantities are generated by re-suspended road dust. $PM_{2.5}$ results from fuel combustion (from motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. The data monitored at the BAAQMD station in Santa Rosa show no violations of the federal and state standards in the 3 years from 2003 to 2005, as shown in Table 2.4-2.

Lead: Lead is a metal that was used to increase the octane rating in auto fuel, a practice that is no longer allowed. This area is in attainment of the state ambient standards for this pollutant.

Receptors

Receptor locations are chosen where the highest CO concentrations seem most likely to occur and where sensitive receptors are located. Sensitive receptors refer to residences, park, playgrounds, schools, hospitals and retirement homes, where children, the elderly, and the acutely ill are likely to reside or spend a substantial amount of time (BAAQMD, 1999). The critical receptor for analysis that is the closest to the highway traffic is 18.3 meters from the traffic. Sensitive receptors along the Project alignment include the Petaluma Valley Hospital, located at 400 North McDowell Road, and residences at various locations adjacent to the Project corridor.

2.4.3 Impacts

Carbon Monoxide

This air quality analysis utilizes the "Transportation Project-Level Carbon Monoxide Protocol," dated December 1997, prepared by the Institute of Transportation Studies, University of California at Davis. This protocol was approved by the MTC in Resolution No. 3075 on June 24, 1998. Use of this protocol was recommended by the Bay Area Interagency Conformity Task Force, which is the interagency consultation group established pursuant to U.S. EPA's conformity regulation and the Bay Area's conformity SIP.

Since the Bay Area was designated an attainment area for CO on June 1, 1998, the protocol indicates that an analysis by comparison is appropriate for this project. This involves a comparison of the proposed facility with existing facilities within the Air District. A list of the features to be compared is given on pages 4-6 to 4-7 of the protocol.

For mainlines, comparisons were made between the year 2010 Build conditions of Route 101 and the existing conditions on I-880 in Alameda County from Route 92 to Route 84; for intersection comparisons, the Foothill/Mission Boulevard intersection was utilized in that same area.

The Traffic Operational Analysis Report (February, 2005) for future years 2010 and 2030 indicates that traffic impacts at nearby intersections will be minimal. Most intersections will experience a less than 5 percent difference in future predicted traffic volumes between the Project's Build and No Build conditions. This difference is not significant given the accuracy of the prediction methodology.

The most critical intersections within the project area are the on- and off-ramps and East Washington Street intersection. This intersection is considerably smaller than the intersection at Foothill and Mission Boulevard, which was used as a point of comparison. The on- and off-ramps are two-lane roads, and East Washington Street is a two-lane per direction road. The Foothill and Mission intersection represents the joining of two major State Routes, plus a connector to downtown Hayward. This five-legged intersection consists of three-lane/three-lane/two-lane/three-lane approaches. Receptor distances are comparable at both intersections – 15 to 20 feet (4.5 to 6 meters). Traffic volumes, queues, delays, and background CO are greater at Mission and Foothill. The facility and a list of the features to be compared are given in Table 2.4-3.

Table 2.4-3 Comparison of Mainline Conditions

Alternative	Parameters	Route 101 (Build)[a]	Route I-880 (Existing)
A	Receptor Distance	18.3 (60')	7.62 m (25')
B	Roadway Geometry	4 lanes	8 lanes
C	Worst-case Meteorology	Coastal Valley	Coastal Valley
D	Peak Hourly Volumes	6,150 vph	15,000 vph
E	Hot/Cold Starts	50/10 NB 50/10 SB	50/10 NB 50/10 SB
F	Percent HDG trucks	0.9-2.9%	7.6-8.3%
G	Background CO	2.0 ppm	3.2 ppm

[a]The Build HOV Lane Alternative was used for the purposes of a worst-case scenario; however, air quality study results also include the Build Fixed Reversible Alternative.

Note:

vph = vehicles per hour

Source: Air Quality Impact Report, Marin-Sonoma Narrows Project on Route 101, November 2005.

The MSN Project Build Alternative will result in a facility that will be similar and less congested than comparable facilities within the same Air District (I-880 and Foothill and Mission). Because the

comparable facilities are in an area that meets air quality standards (maintenance area), this project will also meet microscale air quality requirements and will, therefore, have no significant impact on air quality or cause exceedances of state or federal carbon monoxide standards.

Particulates (PM10 and PM 2.5)

At this time, there is no requirement to quantify PM_{10} or $PM_{2.5}$ impacts, nor are appropriate tools available for analyzing microscale impacts of PM_{10} or $PM_{2.5}$.

Although the U.S. EPA Transportation Conformity Regulations require a quantified microscale analysis for PM_{10} emissions, no approved methodologies are available to address the microscale impacts of PM_{10}. The regulations state that "the EPA will be releasing technical guidance on how to use existing modeling tools to perform PM_{10} hotspot analysis. The requirements will not take effect until the Federal Register has announced availability of this guidance" (40 CFR Parts 51 and 93, Prologue Section V.K.: Federal Register, August 15, 1997). When this guidance becomes available, a quantified PM_{10} microscale analysis may need to be performed as an addendum to the air quality study for this project.

The federal PM_{10} standards have been met in the Bay Area Air Basin. Projects are subject to hot spot analysis for PM_{10} if they are located in a PM_{10} non-attainment or maintenance area (federal standards), for purposes of transportation conformity. The state PM_{10} standard is extremely stringent, and all urbanized parts of California do not meet the standard of 50 $\mu g/m^3$ maximum 24-hour PM_{10}. However, the maximum 24-hour PM_{10} for one year, 2003, published by the Air Resources Board for the Santa Rosa PM_{10} monitoring station (the monitoring station closest to the project site) showed no violations and is 36.3 $\mu g/m^3$, below the state standard of 50 $\mu g/m^3$. Moreover, the proposed Project would not result in increased traffic. Qualitatively, we expect that the proposed Project would not have adverse effects on PM_{10} levels.

Mobile Source Air Toxics

The FHWA's MSAT guidance states that projects with a maximum annual average daily traffic (AADT) count of less than 150,000 are identified as low potential MSAT effects projects. From Caltrans' traffic forecast and traffic operational analysis, the maximum AADT will be approximately 107,000 in the year 2030 at the East Washington Interchange. The truck percentage on the Route 101 corridor is projected to be 4.42 percent in 2030. In addition, the differences in AADT and the truck percentages with and without the proposed Project are negligible.

The amount of MSAT emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. Because the predicted AADT and the truck percentage in year 2030 are basically the same with and without the proposed Project, it is expected that there would be no appreciable difference in overall MSAT emissions.

Conformity with State Implementation Plan

The proposed Project study area is located in a non-attainment area for O_3 and PM_{10}, and includes Transportation Control Measures in the SIP. The most recent transportation plan in the project area is the Transportation 2030 Plan, adopted by MTC on February 23, 2005. The most recent TIP is the 2005 TIP. The FHWA made its conformity determination for the Transportation 2030 Plan and the 2005 TIP in August 2005. The project design scope and concept are substantially the same as the design scope and concept in the RTP and Regional TIP listings. All applicable Transportation Control Measures are included in the project. The project therefore meets the regional tests for conformity with the SIP.

2.4.3 Avoidance, Minimization, and/or Mitigation Measures

None recommended.

2.5 Noise

Federal regulations govern when a highway project's traffic noise increases need to be addressed, as well as when an existing high traffic noise level needs to be addressed. Caltrans complies with these federal regulations (Code of Federal Regulations Title 23, Section 772) by applying its Traffic Noise Analysis Protocol (TNAC) (August 2006). According to the policies outlined in the TNAC, project proponents must consider noise abatement measures when highway traffic noise levels are predicted to reach 66 dBA ("A-weighted decibels") or above.

In California law, CEQA provides a broad basis for analyzing and addressing the change in noise levels caused by highway projects.

2.5.1 Affected Environment

In the vicinity of East Washington Avenue, there are residential and commercial land uses on both sides of US 101. In characterizing the existing noise environment, the Caltrans Office of Environmental Engineering studied existing noise levels at twelve locations throughout the project boundaries. The locations were generally chosen from the first row of homes closest to the freeway, since these "receptors" are most vulnerable to changes in the noise environment along US 101. Caltrans' noise study concluded that existing traffic noise levels were between 65 dB and 75 dB at the twelve residences.

2.5.2 Environmental Consequences

The Caltrans Office of Environmental Analysis used the FHWA computer model known as TNM Version 2.5 to calculate existing and future noise levels. They concluded that, if the interchange modifications are built, the maximum increase in noise level at any location would be under one decibel. A noise increase of three decibels is considered the minimum increase that a person can perceive, so a one-decibel increase would be imperceptible to receptors.

Even though the increase in noise levels would be imperceptible, and would not result in a significant noise impact under CEQA, the Office of Environmental Engineering conducted additional studies for compliance with regulations that have jurisdiction over highway noise levels (Traffic Noise

Study Report, July 12, 2007). Caltrans complies with the pertinent federal regulation (23 CFR 772) by implementing the Traffic Noise Analysis Protocol, as described earlier. According to the noise analysis protocol, when a project is proposed where existing traffic noise levels are above 65 dB in residential areas, Caltrans needs to consider adding noise abatement features such as soundwalls. The noise study for the East Washington interchange improvements predicted that future noise levels at most residential areas within the project limits would exceed 65 dB, whether or not the project was built. Therefore, consideration of noise abatement is required under Title 23, Code of Federal Regulations, Part 772 (23 CFR 772) and under Caltrans' Traffic Noise Analysis Protocol (TNAP, 2006).

The TNAP provides examples of considerations used to determine reasonableness and feasibility. These considerations include whether the soundwalls would substantially reduce noise exposure (a reduction of at least 5 decibels), whether they are cost-effective, whether they pose visual impacts or adversely affect environmental resources, and whether they are acceptable and desirable in the local jurisdictions. This project's noise study identified two soundwalls that would be feasible. The actual determination of whether those soundwalls will be constructed will be made prior to the final environmental document.

2.5.3 Avoidance, Minimization, and/or Mitigation

None proposed.

2.5.4 Construction Noise

Affected Environment

Existing peak hour noise levels ranging from 59 to 75 dBA Leq(h) have been measured and estimated at various locations within the Project limits along Route 101. At present time, some residences are receiving noise levels over the federal/state NAC of 67 dBA Leq(h). Sensitive receptors along the Project alignment include the Petaluma Valley Hospital, located at 400 North McDowell Road, and residences at various locations adjacent to the Project corridor.

Environmental Consequences

Noise levels along the Project alignment would increase in the short term from construction related noise. Construction noise at the proposed Project site would be intermittent and its intensity would vary. Noise levels typically associated with the types of equipment that would be utilized during Project construction are listed in Table 2-6.

During the construction period, some of the sensitive receptors that are close to the highway may be exposed to high noise levels. Effective noise control during the construction of a Project means minimizing noise disturbances to the surrounding communities. Combinations of impact minimization techniques, as outlines below, would be implemented during Project construction to minimize any noise-related impacts to residences and businesses located within or adjacent to the Project area.

Table 2-6 Construction Operation Noise Levels

No. of	Equipment Type	Maximum Equipment Noise Level at 15 m (dBA)	Hourly Equivalent Noise Levels at 15 m (dBA)[a]	Hourly Equivalent Noise Levels at 30 m (dBA)[a]	No. of Items	Equipment Type	Maximum Equipment Noise Level at 15 m (dBA)	Hourly Equivalent Noise Levels at 15 m (dBA)[a]	Hourly
Clear and Grub					**Earthwork**				
1	Excavator	83	80	74	1	Excavator	83	80	74
1	Backhoe	75	72	66	1	Backhoe	75	72	66
4	Heavy Duty Dump Trucks	77	74	68	1	Front Loader	74	71	65
		Overall $L_{eq}(h)$	84	78	1	Dozer	85	82	76
					1	Trencher	80	77	71
Bridge Demolition					4	Heavy Duty Dump Trucks	77	74	68
1	Backhoe	75	72	66			Overall $L_{eq}(h)$	87	81
1	Excavator	83	80	74					
4	Heavy Duty Dump Trucks	82	79	73	**Structures**				
		Overall $L_{eq}(h)$	87	81	1	Excavator	83	80	74

						1	Backhoe	75	72	66
Retaining Walls						1	Bormag BMP 851	80	77	71
1	Backhoe	75	72	66		1	Crane	85	82	76
1	Bormag BMP 851	80	77	71		1	Concrete Pump	81	78	72
1	Concrete Pump	81	78	72		1	Compressor	68	65	59
1	Compressor	68	65	59		1	Bridge Deck Paver	77	74	68
3	Ready Mix Trucks	81	78	72		2	Flatbed Truck	75	72	66
4	Medium Duty Dump Trucks	77	74	68		1	Pile Driver	80	77	71
2	Flatbed Truck	75	72	66		4	Medium duty Dump Trucks	77	74	68
		Overall L_{eq}(h)	87	81		3	Ready Mix Trucks	81	78	72
								Overall L_{eq}(h)	89	83
Paving					**Miscellaneous**					
1	Grader	75	72	66		1	Loaders	74	71	65
1	Water Truck	77	74	68		1	Dozer	85	82	76
1	Vibratory Roller	78	75	69		2	Medium duty Dump Trucks	77	74	68
1	Compactor	76	73	67				Overall L_{eq}(h)	84	78
1	Concrete Pump	81	78	72						

3	Ready Mix Trucks	81	78	72		
1	Asphalt Paver	79	76	70		
1	Asphalt Roller	78	75	69		
1	Sweeper	79	76	70		
4	Medium Duty Dump Trucks	77	74	68		
2	Flatbed Truck	75	72	66		
		Overall $L_{eq}(h)$	88	82		

[a]Predicted noise levels are from the center of the construction activity.

Source: Parsons, 2005

Notes: Calculated construction noise levels assume that all equipment operates for 6 hours out of an 8-hour day. Calculations also assume that all equipment is operated at full load 70 percent of the time.

Avoidance, Minimization, and/or Mitigation

Construction would occur in compliance with the provisions set forth in Section 7-1.01I of Sound Control Requirements, included in the latest Caltrans Standard Specifications. These Standard Specifications are meant to minimize the impact from short duration construction noise, and include the following requirements:

- Each internal combustion engine, used for any purpose on the job or related to the job shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall operate without a muffler.

- Ensure that all equipment items have the manufacturer's recommended noise abatement measures, such as mufflers, engine enclosures, and engine vibration isolators, intact and operational. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding, etc.) (Caltrans, 1999).

In addition to the aforementioned Standard Specifications, construction noise impacts can be minimized by implementing some or all of the following administrative measures:

- Avoid construction activities during the nighttime and on weekends.

- Keep noisy equipment and haul roads away from sensitive receptors.

- Keep the community informed of upcoming, especially noisy construction activities and establish a field office to handle noise complaints.

2.6 Biology, Including Wetlands

The analysis provided below is based on a Natural Environment Study (NES) completed for the proposed Project in March 2007

2.6.1 Affected Environment

The terrain within the Project area is mainly flat, with low rolling hills in the surrounding area. Oaks (*Quercus* sp.) are scattered throughout the surrounding area. Eucalyptus (*Eucalyptus* sp.) and coastal redwoods (*Sequoia sempervirens*) comprise the majority of trees within the Project area. The redwoods within the Project limits are in very poor health because this species thrives in cooler, moist coastal climates, rather than the hot, dry climate in Petaluma. In addition, the pollutants from traffic along Route 101 add to their unhealthy condition.

Washington Creek is the only waterway within Project limits. This creek carries water and large quantities of sediment from Sonoma Mountain to the Petaluma River and is somewhat degraded within the Project area. The creek also carries large quantities of sediment from Sonoma Mountain into the Petaluma River. Vegetation surrounding Washington Creek in the vicinity of the Route 101 Washington Creek Bridge consists mainly of willow (*Salix* sp.), cottonwood (*Populus fremontii*), and ornamental shrubs on the northeast side of Route 101 where the new free-span on-ramp will be constructed.

2.6.2 Environmental Consequences

Tree Removal

Under the worst-case scenario (build alternative), the Project would entail the removing of approximately 780 trees. The majority of these trees are coastal redwoods that are in poor health (per Caltrans conversation with Bill Cox, CDFG Fisheries Biologist and Sonoma County contact). Because of their poor health and proximity to the roadway, the redwoods to be removed do not provide optimum nesting habitat. However, nesting bird surveys will be conducted within 2 weeks prior to project construction to ensure that no birds or their nests will be impacted by construction activities. The healthiest redwoods are at the northern end of the project limits and the project Design team will take every precaution to avoid these trees.

Table 2-7 shows a worst-case scenario of trees that would be removed during the East Washington Interchange Project.

Table 2-7 East Washington Interchange Project Tree Removal Counts Worst-Case Scenario (NE and SW Quadrants)

Species	Total	Questionable
Northeast Quadrant		
Coast live oak	6	3
Locust	1	1
Poplar	73	15
Red willow	13	7
Coast redwood	181	2
Subtotal	274	28
Southwest Quadrant		
Pine	32	32
Coast redwood	411	3
Subtotal	443	35
Total	717	63
Grand Total Including. Questionable Column	780	

[a]Questionable trees are ones located within or near on/off-ramps that may be left in place per Landscape Design if possible.

No sensitive species were observed within the Project limits during surveys, and no impacts to sensitive species are anticipated as a result of this Project.

Wetland Impacts

No planned Project-related work will occur in Washington Creek. A roadside ditch built in uplands at both ends comprising of approximately 80.67 cubic yards (yd^3 or 0.05 acre) is within the project boundaries and will be temporarily impacted by construction activities. Figure 2.6 shows the roadside ditch between Washington and Lynch Creeks. This area is only inundated with water after rain events, and the water is carried to both Washington and Lynch Creeks. A new ditch would be constructed immediately east of the existing location and would maintain the same characteristics of the original northern half of the ditch. Water would be piped to Washington Creek in the southern half of the ditch. Both methods would maintain current flow characteristics. If it is determined by the U.S. Army Corps of Engineers that the ditch may be delineated wetlands of Waters of the U.S., we will apply for required permits and make sure we comply with the no net loss policy.

Figure 2.6 – Wetland/Waters of the U.S. ditch between Washington Creek and Lynch Creek

Note that photo was taken during a rain event (November 2006).

2.6.3 Avoidance, Minimization, and/or Mitigation

Impacts associated with the proposed tree removal will be minimized by scheduling tree removal activities outside of nesting season. Additionally, a Caltrans biologist will conduct a survey for nesting birds within 2 weeks prior to the beginning of construction, including the removal of any vegetation. If any nests are observed, all work in the area will cease and CDFG will be contacted.

Although the proposed tree removal would not result in a loss of habitat, it may result in aesthetic impacts; these potential impacts and associated impact minimization measures are discussed in Section 2.3 of this document.

Impact Minimization Measure 2.6-1: Caltrans will replant as many trees and other vegetation as possible within project limits to compensate for tree removal, and plant riparian trees in an area owned by the Sonoma County Water Agency. This area, along the Washington Creek channel, is approximately 1.61 kilometers (1 mile) upstream of the construction project. Sonoma County Water Agency will maintain the trees for a period of 3 years. Caltrans will monitor the trees for a period of 5 years, and supply monitoring reports as dictated by CDFG. In addition, any vegetation in the area of the new northbound on-ramp that can be trimmed rather than removed will be trimmed to International Society of Arboriculture (ISA) standards.

Impact Minimization Measure 2.6-2: Caltrans BMPs will be utilized to avoid silt and debris loading in Washington Creek below the construction activities. Methods used will include designating an ESA from top of bank to top of bank along Washington Creek within the Project area. ESA fencing will be placed 1 m (3 ft) around 3 outfall locations. All work around outfall locations will be conducted with hand tools to reduce impacts to the creek and bank. No work will be conducted inside the ESA. Also, a temporary straw bale barrier will be used at the base of the ESA fence to keep silt and debris from leaving the construction area. All generated debris, fill, and excess material will be removed from the site and disposed of in an approved location outside of USACE and CDFG jurisdiction.

The following measures need to be incorporated into Project BMPs:

- Any in-channel work will be conducted between June 15 and October 15 to prevent sedimentation of the stream.
- Removal and disturbance of riparian vegetation will be minimized and avoided to the fullest extent possible.
- An SWPPP will be incorporated and implemented by the contractor to prevent sedimentation of the stream channel and protect water quality.

Impact Minimization Measure 2.6-3: All trees within the Project area will be trimmed to ISA standards to ensure proper g rowth and vigor upon Project completion.

Impact Minimization Measure 2.6-4: The existing roadside ditch (wetlands area) will be relocated and constructed in the same manner immediately east of the current location.

As proposed, the Project's impacts to biological resources would be less than significant.

2.7 Cultural Resources

2.7.1 Regulatory Setting

Identification of Historic Properties

Under Section 106 of the National Historic Preservation Act of 1966, federal agencies are required to take into account the effects of their undertakings on historic properties. Historic properties are those that are included in the National Register of Historic Places (NRHP) or that meet the evaluation criteria for the National Register. The National Register is the official inventory of the nation's

historic places that are worthy of preservation. The evaluation criteria include an association with events that have made a significant contribution to the broad patterns of our history (Criterion A); an association with the lives of persons significant in our past (Criterion B); that embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values (Criterion C); that have yielded, or may be likely to yield, information important in prehistory or history (Criterion D). If the project may result in effects to historic properties, the agency must determine the scope of appropriate identification efforts and then proceed to identify historic properties in the area of potential effects, or APE.

After completing identification efforts, the agency, in consultation with the SHPO or THPO assesses the effects of the project on the identified historic properties based on the adverse effect criteria found in the Advisory Council on Historic Preservation's regulations found at 36 CFR 800. If there is agreement among the agencies consulted that there will be no adverse effect, the lead agency proceeds with the undertaking and any agreed-upon conditions. If they agree that there will be an adverse effect, the agency begins consultation to seek ways to avoid, minimize or mitigate the adverse effects. Properties found eligible under Section 106 are consequently considered historical resources under CEQA.

Methodology

In accordance with CEQA and with the January 1, 2004 *Programmatic Agreement among the Federal Highway Administration, the Advisory Council on Historic Preservation, the California State Historic Preservation Officer, and the California Department of Transportation*, Caltrans prepared a Historic Property Survey Report (HPSR) for the East Washington Street Interchange Project and initiated consultation with the SHPO in May 2005. The HPSR was intended to fulfill three of Caltrans' responsibilities under Section 106 of the National Historic Preservation Act: determination of the APE; identify potential historic properties located within the Project's APE; and evaluate potential historic properties for eligibility to the NRHP. Included as attachments to the HPSR are the Archaeological Survey Report and the Historical Resources Evaluation Report, which identify both historical properties and archaeological resources present within the Project vicinity.

Previously recorded archaeological sites within and adjacent to the APE were identified through a record search and literature review conducted at the Northwest Information Center of the California Historical Resources Information System for the Marin-Sonoma Narrows Project, which included the study area for this Project. Also consulted were the Sonoma County Assessor's Records, including parcel maps and property records, the California State Library, and the Caltrans Cultural Resources Library. In addition, reports on file with Caltrans District 4 in Oakland were reviewed for information related to the Project area.

2.7.2 Affected Environment

Architectural Resources

Consultation and identification efforts, including checks of Historic landmarks lists and California Points of Historic Interest and background research conducted at the California State Library and the Caltrans Cultural Resources Library, resulted in the identification of three resources within the APE

that required formal evaluation for NRHP eligibility. The resources evaluated included the following three housing tracts, originally constructed in the early to mid-1950s:

1) Montclair Manor Subdivision

2) McDowell Village Subdivision

3) Novak Subdivision #2

Caltrans' evaluation found that none of the three properties were eligible for the NRHP, as none of the homes nor the subdivision designs possessed architectural or historic significance or were associated with significant persons or events. On June 17, 2005, Caltrans received concurrence from SHPO with their finding of ineligibility. Therefore, it has been determined that no buildings or structures in the APE which meet the criteria for listing on the NRHP, or that are considered historical resources for the purposes of CEQA compliance.

Archaeological Resources

The APE for the Project was surveyed previously for archaeological resources as part of the archaeological study conducted for the Marin Sonoma Narrows Project during the period from 2001 to 2003. During the archaeological survey, a crew of five walked the entire study area spaced at 30-m intervals. In areas where visibility was reduced by vegetation or disturbance, crew members periodically scraped the ground surface. No archaeological resources were identified within or immediately adjacent to the study area; nor were any known archaeological resources found to be located within the APE as a result of the record search and literature review.

2.7.3 Environmental Consequences

Architectural Resources

The HPSR conducted for this Project found that no properties eligible for NRHP listing are present within the Project's APE. Any properties located within the Project vicinity, but outside of the APE that are eligible for inclusion within the NRHP would not be affected by the proposed Project. Therefore, no adverse affects to historic properties per Section 106 criteria, or significant impacts for the purposes of CEQA, would occur as a result of the proposed Project.

Archaeological Resources

Based on information collected during field surveys and documentary research, it is not anticipated that construction activities would encounter or disturb buried archaeological resources. Implementing Caltrans standard protocol for minimizing impacts to cultural resources, would reduce any potential impacts to buried, previously undocumented archaeological deposits to a less than significant level.

2.7.4 Avoidance, Minimization and/or Mitigation

Because no historic or prehistoric resources were identified within the Project area, no adverse effects to cultural resources are anticipated as a result of Project implementation. If cultural materials are

discovered during construction, Caltrans standard protocol will be followed: all work in the vicinity will cease until a qualified archaeologist can evaluate the nature and significance of the find.

Implementation of this protocol would minimize any potential impacts to cultural resources such that no significant impacts would occur.

2.8 Geology

2.8.1 Affected Environment

The Project site is located in the San Francisco Bay Area, within the California Coast Range geomorphic province. This province comprises a series of long, northwest trending mountain ranges separated by parallel river valleys, including the Petaluma Valley, where the Project is located. The alluvium of the Petaluma Valley is interbedded with marine sediments, which overlie the Glen Ellen formation. The Glen Ellen formation consists of lenticular tongues and beds of poorly sorted gravel, sand, silt, and clay.

The entire Project area is covered by Holocene alluvial sediments, deposited by streams emanating from the mountains as debris flows, hyperconcentrated mudflows, or braided stream flows. Sediments include sand, gravel, silt, and clay that are moderately to poorly sorted, and moderately to poorly bedded. This unit includes active stream channels that are too narrow (U.S. Geological Survey Open File Report 98-460). Logs of test borings show that the top layer consists of soft silty clay interbeded with loose to medium dense sand/silty and underlain by relatively firm to stiff clay (Caltrans, 2006, Geotechnical Design Report, Washington Creek on-Ramp). The Project area is located within the Petaluma Valley Groundwater Basin, wherein groundwater depth ranges from groundwater elevation 16.7 feet to 23.6 feet.

The San Francisco Bay Area is a well-known region of continuing seismic activity. The Rodger Creek Fault is considered an active fault and is located within 3.7 miles (6 kilometers) to the east of the Project. The other active faults in the area include the West Napa Fault and Hayward Fault, located approximately 16.5 and 18.9 miles (26.7 and 30.4 kilometers, respectively) to the south and southeast of the site, respectively. All of these faults are within the San Andreas Fault system and have produced major earthquakes in historical time. Table 2-8 lists the distances from the project to nearby active faults, estimated maximum credible events, and the maximum credible rock acceleration anticipated at the Project location.

Table 2-8 Fault Systems and Activity Levels

Fault	Distance from Project (km)	Maximum Credible Earthquake[a]	Peak Acceleration (g)[b]
Rodger Creek	6.0	7.0	0.46
San Andreas	25.9	8.0	0.36
West Napa	26.7	6.5	0.14

Hayward	30.4	7.5	0.22
[a]Magnitude in Moment Magnitude (M_w), Scale to the nearest quarter unit. [b]The unit "g" is a measure of ground motion acceleration in relation to the acceleration rate of gravity.			

Although strong ground shaking is expected at the Project site during moderate to severe earthquakes in the San Francisco Bay Area, the Project area is not crossed by any active fault. As a result, there is low potential for ground rupture on the Project site.

Some loose to medium-dense silty sand/sand layers are susceptible to liquefaction during a major seismic event. Based on the liquefaction analyses, some sand layers encountered, in the range of 10 to 20 feet deep, are theoretically liquefiable. The probability of liquefaction occurring in the northern portion of the project site is relatively low (City of Petaluma, 2005, East Washington Place Environmental Impact Report).

The project site is relatively flat and is not located adjacent to any hillsides. Thus the landslide risk is low.

Moderately to highly expansive soils were found to be blanketing much of the site. The soils are non-corrosive (Materials File, 2006).

Most soils covering the project area are classified as very slightly erodible or not erodible according to the Natural Resource Conservation Service (formerly Soil Conservation Service).

2.8.2 Environmental Consequences

The proposed Project includes the following elements that could result in impacts to geological resources: roadway embankment, ground improvement, bridge improvement, retaining walls, and minor structures such as roadway signs.

Widening Route 101 in both northbound and southbound directions would require fill up to 3.0 meters high. It is proposed that a portion of these fills be retained by retaining walls on pile foundation, located near ROW. The geotechnical design recommendations prepared for this Project indicate that these soils will settle more than 200 mm in some locations. Because the settlement will occur immediately behind the retaining wall footing, it will adversely affect the roadway grade and drainage. The geotechnical analysis also indicates specific locations along the proposed roadway widening at which excessive settlement is likely to occur. Lightweight fill will be utilized in these areas in lieu of regular fill to reduce anticipated settlement to an acceptable level. With the use of lightweight fill in targeted areas, along with implementation of measures outlined below, impacts associated with fill settlement would be less than significant.

Shallow groundwater, especially in the southern portion of the site, could affect grading and underground construction activities because shallow groundwater may result in potentially wet and unstable subgrade soils, difficulty achieving compaction, and difficult underground utility installation.

2.8.3 Avoidance, Minimization, and /or Mitigation Measures

All Project-related construction will occur in accordance with the California Building Code, which requires that structures should be built to withstand a 7.0 magnitude earthquake. Further, Project design and construction will comply with measures set forth by the California Division of Mines and Geology Guidelines for Evaluating and Mitigating Seismic Hazards.

2.9 Hydrology and Water Quality

A Water Quality Study Report was prepared May 5, 2007. A Storm Water Data Report was also prepared by WRECO in February, 2007.[2]

2.9.1 Environmental Consequences

The onsite drainage design for this Project is based on the procedures presented in the Caltrans *Highway Design Manual*, and design criteria details are located in the Drainage Report. The Drainage Report will be available upon publication of the Draft ISMND at the Caltrans District 4 offices, the Petaluma Public Library, and other locations where the document is available for public review.

Washington Creek

No impacts have been identified associated with the proposed bridge along the northbound diagonal on-ramp over Washington Creek. The only offsite drainage affecting the site is from the limited watersheds in portions of the properties immediately adjacent to ROW. Runoff from these limited watersheds would be captured by proposed onsite facilities, including a new storm drain pipe system in the northeast quadrant.

Proposed Drainage Improvements

A new 450-mm drainage system would be constructed to accommodate the runoff from the new northbound Route 101 on-ramp. This system would tie into a new 600-mm outfall to Washington Creek, situated south of the mainline and immediately north of the proposed bridge that would span the creek. The runoff from the strip mall adjacent to the new on-ramp would be collected in a 450-mm drainage system located along the ROW line and would connect to the 600-mm outfall at Washington Creek. The 600-mm outfall replaces the outfall of the existing roadside ditch to Washington Creek currently occupying this location. Drainage north of the new on-ramp would continue to utilize a portion of the existing ditch that drains into Lynch Creek.

The Project would place a biofiltration strip along southbound Route 101 between the ROW and the edge of shoulder from just north of Caulfield Lane to the entrance of the southbound on-ramp from East Washington Street. The biofiltration strip would have the capacity to treat runoff from approximately 5.68 acres (2.3 hectares) of impervious area. The added impervious area for the Project is 3.28 acres (1.33 hectares), and the reworked area is 2.2 acres (0.89 hectare).

The treated runoff would flow along a drainage ditch to the south along the ROW. The ditch would be lined from approximately 100 feet north of Caulfield Lane to just south of the pedestrian overcrossing. From just south of the pedestrian overcrossing to the entrance of the southbound on-ramp from East Washington Street, the ditch would be unlined.

A roadside ditch is being impacted due to highway widening and a new northbound on-ramp in the northeast quadrant, which drains to Lynch Creek. The southern half is federal jurisdictional waters that flow to Washington Creek. The man-made ditch, built in upland conditions, is ephemeral and functions as a conveyance for roadside runoff. Part of this ditch may have some features typical of wetlands.

2.9.2 Avoidance, Minimization, and/or Mitigation Measures

Hydrology

Drainage design for this project includes locating pavement and field inlets, grading off-pavement areas, sizing culverts and drainage facilities to handle onsite and offsite flows, and modifying or relocating existing facilities that were designed and constructed as part of past highway construction projects. Offsite drainage to onsite facilities has been considered in the design of the onsite facilities. No significant changes to the hydrology and hydraulics of the receiving waters (unnamed drainage ditch, Washington Creek, Lynch Creek) are expected.

The project will relocate the wetland portion (0.05 acres) of the ditch in kind to the east and transmit the waters of the U.S. half (0.05 acres) in a manner as to not impede flow rates. The San Francisco Bay Regional Water Quality Control Board considers these impacts as permanent and may require the Department to replace or compensate for the area's wetland values. The Department might replace the wetland values by purchasing credits at a nearby mitigation bank. One possible bank is the Hazel Mitigation Bank in the City of Santa Rosa Plain area. The current estimate is $425,000/acre.

Water Quality

According to Caltrans National Pollutant Discharge Elimination System (NPDES) permit and Construction General Permit, a variety of BMPs would be incorporated into the project design and construction contract to reduce the discharge of pollutants during construction and over the life of the project to the maximum extent practicable. These BMPs fall into three categories: construction site BMPs that are temporary in nature, pollution prevention BMPs that would be incorporated into the project design, and permanent BMPs to treat long-term runoff and stormwater. A general description of these measures follows.

Construction Site BMPs

Construction site BMPs are implemented during construction activities to reduce pollutants in stormwater discharges throughout construction. For instance, areas requiring grading of existing slopes and tree removal where soil disturbance is greater than 1 acre (0.4 hectare), an SWPPP would be developed prior to construction. The deployment of various erosion and water pollution control measures would be implemented, such as temporary silt fencing, contained concrete, washout areas, stockpile cover, stabilized construction entrance/exit, and temporary soil stabilizers, to prevent and minimize soil erosion and sediment discharges during construction.

Permanent Pollution Prevention BMPs

Pollution prevention BMPs are permanent measures that would be incorporated into project design to improve stormwater quality by reducing erosion, stabilizing disturbed soil areas, and maximizing vegetated surfaces. Erosion control measures would be provided on all disturbed areas to the extent feasible. These measures can utilize a combination of source and sediment control measures to prevent and minimize erosion from areas of ground disturbance. Source controls can utilize erosion control netting in combination with hydroseeding. The biodegradable netting is effective in providing good initial mechanical protection while seed applied during the hydroseeding operation germinates and establishes itself. Other forms of source control, such as tacked straw, may also be used where applicable. Sediment controls, such as biodegradable fiber rolls, can be used to retain sediments and to help control runoff from disturbed slope areas.

Outlet protection and velocity dissipation devices placed at the downstream end of the culverts and channels are also pollution prevention BMPs that reduce runoff velocity and control erosion and scour. The need for these devices for this Project will also be further investigated during the design phase.

Permanent Treatment BMPs

Treatment BMPs are permanent devices and facilities constructed to treat stormwater runoff. Permanent treatment BMPs considered for this project include biofiltration strips.

Because this Project is within a dense urban area (City of Petaluma) and will entail soil disturbance, permanent treatment BMPs, such as those previously mentioned, have been considered for the Project.